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Application for Patent

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Director-General of the Patent Office: Yukio Miyake

1. Title of the Invention: Neck-down Core Having a Special Shape

2. Inventor

Address: 1780 Uetakano Yachiyo City, Chiba Prefecture

Kawasaki Heavy Industries, Ltd. Yachiyo Plant

Name: Kaoru Horiuchi (Other 2)

3. Applicant:

Address: 2-14 Higashi Kawasaki Machi, Ikuta Ku, Kobe City, Hyogo Prefecture

(097) Kawasaki Heavy Industries, Ltd.

Representative: Kiyoshi Shimoto

4. Attorney: 105

3-15-8 Nishi Shinbashi, Minatoku, Tokyo To

Nishi Shinbashi Chuo Building #508; Phone: (432) 7697

Name: Patent Attorney (7585) Yukiharu Tomita

5. List of Attachments

(1) Specification: 1

(2) Drawings: 1

(3) Application Document Duplicate: 1

(4) Power of Attorney: 1

Specification

1. Name of the Invention

   Neck-down Core Having a Special Shape

2. Scope of Claims

   A neck-down core forming a fracture surface, interposing a riser and a product, that places a flange portion on a product surface, and equips a notched edge with the fracture surface lower than the product surface in an aperture.

3. Detailed Description of the Invention

   The present invention relates to the formation of a fracture surface by interposing a neck-core down between a riser and a product, and particularly to a neck-core down that shortens grinding work after removing the riser from a casting.

   It is commonly known that castings are formed by flowing molten metal into a mold. However, because of physical properties, molten metal usually contracts during solidification. Therefore, products must naturally be equipped with risers to compensate for the volume of that contraction. When solidification is complete after casting, the mold is disassembled and the risers are removed.

   Conventionally, as shown in FIG. 1, risers 2 attached directly to a product 1 are normally removed by gas cutting (cutting plane line 3), and a remainder of the riser 4 is ground to the product surface using a grinder, etc. Because this method uses gas to cut the risers, there is a high thermal effect applied to the product. Materials that are sensitive to heat are particularly at risk of cracking because of the gas cutting. This tendency is particularly notable when it is necessary to remove risers prior to annealing or normalizing, or when the casting defects are intrinsic, for example shrinkage cavities in the connecting portion of the riser and the product. Furthermore, there is a disadvantage in that as riser diameters increase, more time is required for cutting. Thus, there is a difficulty in that there is an increase in the thermal effect, and the time required for grinding the remainder of the riser after cutting becomes excessive. Therefore, to solve the problems outlined above, a neck-core down 5 was used, as shown in FIG. 2. Here, a method is used for knocking off the risers that does not rely on gas cutting by using the neck-core down 5. Therefore, this method has the benefits of considerably shortening cutting time, of having no thermal effect, etc. To that extent, this method is widely used on hard materials or castings of materials that are sensitive to heat.

However, for tough materials, or when an aperture 6 of the neck-down core 5 is large, there are cases in which mechanically removing risers using this method is difficult. In such cases, the conventional gas cutting method must be applied. However, this method is advantageous in such cases because a reduced cutting surface area minimizes thermal effect.

However, after cutting, in the case shown in FIG. 1, grinding time is shortened, but there is the disadvantage in that a remainder of the riser 7 must be ground down.

On the other hand, when considering the removal of risers, there is a merit in that the aperture 6 of the neck-down core 5 is as small as possible, but with such a casting method, the cutting surface area of the riser connecting portion decreases, so there is a demerit in that riser efficacy is limited.

Therefore, it is preferred that the inner diameter of the aperture 6 is kept at the minimum limit at which riser efficacy can be maintained. Of course, the optimum inner diameter of the aperture 6 varies according to the process of casting solidification, and it must be found by experimenting, depending on the type of steel. Also, the optimum value for a thickness 8 is found from the properties of high temperature strength and thermal conductivity depending on the material of the neck-down core 5.

Based on the prior art, an objective of the present invention is to solve the problems of the risers and product, eliminate the disadvantages of a conventional neck-down core, eliminate the disadvantages associated with the removal, to eliminate the necessity of a grinding process after removal.

A configuration of the present invention to attain the aforementioned objective is to install a flange surface of the neck-down core on the product surface, set a fracture surface lower than the product surface to eliminate a need for grinding after cutting, equip a riser at a location where a concave portion occurring on the product is non-vital in terms of product specification, and provide notched edges in the aperture to allow fractures in the cooling process of a product, that can be used for either an apex riser or the side riser in a proposed casting method.

Next, an embodiment of the present invention will be described with reference to the drawings.

9 is a flange portion of the neck-down core 5 and is installed on a surface 10 of the product 1. A fracture surface 11 is set to come below the product surface, and a notched edge 12 that forms the fracture surface 11 is equipped as an inner diameter of the aperture 6. 13 is a depth from the product surface 10 of the neck-down core 5; 8 is the notched angle.

In the configuration described above, when a shock load is applied to a riser 2, stress concentrates on the notched edge 12 of the aperture 6 fracturing the riser 2. However, the fracture surface 11 varies according to the material. As an object becomes more brittle, brittleness fractures can occur, so although a surface may be smooth, ductile fractures can

occur as flexibility increases, thereby causing unevenness in the fracture surface.

Therefore, the neck-core down of the present invention is notably effective for hard-material casting.

By equipping a notched edge, a notched angle 8 is arranged. The notched angle 8 is important in core function. As the aperture diameter Dn of the aperture 6 increases, the notched angle 8 becomes smaller. A range from approximately 30 degrees to 120 degrees is appropriate in the design. In other words, there is another benefit, if the notched angle 8 is small. By providing the notched angle 8, mold stress concentrates at the notched edge 12 in the cooling process of the product after casting, and fractures occur. The occurrence of parallel fractures in the fracture surface at that time is actually effective in cutting the riser. An appropriate value for the hole diameter Dn of the aperture 6 is most required for the depth 13 from the product surface 10. If the depth 13 is designed to be shallow, the convex portion of the fracture surface 11 protrudes from the product surface 10 and grinding becomes necessary, impairing the function of the neck-down core 5 as the invention.

The aperture diameter of the aperture 6 and the ratio Dn/Df of the riser diameter, and the thickness 8 are the same as a conventional neck-down core. As the riser diameter increases, the thermal effect on the neck-core down increases, so the selection of materials that have high heat strength and heat-resisting properties is important.

4. Brief Description of the Drawings

FIG. 1 to FIG. 4 are explanatory views of the prior art; FIG. 1 is a sectional view of a general method of riser removal; FIG. 2 is an explanatory view of the state after cutting a riser; FIG. 3 is a sectional view of the removal of the riser using a conventional neck-core down; FIG. 4 is an explanatory view showing a state after mechanically removing the riser; FIG. 5 to FIG. 8 show embodiments of the present invention; FIG. 5 is a sectional view of an embodiment; FIG. 6 is a sectional view of another embodiment; FIG. 7 is a sectional view of the method of removing the riser using the embodiment of FIG. 5; FIG. 8 is an explanatory view of the state after the riser is mechanically removed.

9 • • • Flange portion　　1 • • • Product
10 • • • Product surface　　11 • • • Fracture surface
12 • • • Notched edge　　6 • • • Aperture
5 • • • Neck-down core

Applicant: Kawasaki Heavy Industries, Ltd.
Attorney: Yoshiharu Tomita

5. Additional Inventors

Address: 1780 Uetakano Yachiyo City, Chiba Prefecture

Kawasaki Heavy Industries, Ltd. Yachiyo Plant

Name: Asaichi Iino

Address: 1780 Uetakano Yachiyo City, Chiba Prefecture

Kawasaki Heavy Industries, Ltd. Yachiyo Plant

Name: Hiroshi Takahashi

Written amendment/correction

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Japanese Patent Office: ~~Yukio Miyake~~ Hideo Saito

1. Case Identification

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2. Title of the Invention: Neck-down Core Having a Special Shape

3. Amending Party

   Relationship to Case: Applicant

   Address: 2-14 Higashi Kawasaki Machi, Ikuta-Ku, Kobe City, Hyogo Prefecture

   (097) Kawasaki Heavy Industries, Ltd.

   Attorney: Kiyoshi Nishimoto

4. Attorney

   Address: 3-15-8 Nishi Shinbashi, Minatoku, Tokyo To

   Nishi Shinbashi Chuo Building, 508; Phone: (432) 7697

   Name: Patent Attorney (7585) Yukiharu Tomita

5. Date of Amendment Directive

6. Number of inventions (claims) added by the amendment

7. Parts Amended 1. Proof of Power of Attorney 2. Specifications and 3. Drawings

8. Content of the Amendment 1. See separate sheet

   2. Amended as shown on separate sheet.

   3. Appended drawings amended as shown in red.

Specifications amended as outlined below.

1. Page 2; Line 16: Amended "FIG. 2" to "FIG. 3."
2. Page 3; Line 5: Amended
3. Same page; Line 11: Amended "FIG. 1" to "FIG. 2."
4. Same page; Line 16: Deleted